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ABSTRACT

This report summarizes in tabular form the results of national studies that were conducted in Belgium, France, Germany, Italy, and the United Kingdom to identify the job skills and knowledge required of persons employed in the fields of rehabilitation and conservation of historic buildings. Presented in chapter 1 is a comparative analysis of the situation existing with respect to the following issues/aspects of the rehabilitation/restoration sector of each of the five countries: legislation and regulation, scale of the market, firms and their workers, and training and qualifications. Chapter 2 consists of 14 tables detailing the skills required in connection with each component of buildings needing rehabilitation/restoration. In the tables, information regarding parts of buildings, defects, contingencies, treatment, techniques, and knowledge is provided for each of the following building components/restoration processes: foundations; walls; partition walls; floors; woodwork; roof coverings; waterproofing and drainage; plasterwork; joinery; glazing; tiling and paving; painting; metalwork; and sanitary installations, heating, and electricity. Discussed in chapter 3 are considerations entailed in building a pool of skilled workers in the restoration and rehabilitation trades and factors conducive to formulating occupational profiles (exchanges and networks, instructor training, and official recognition of qualifications). (MN)

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Occupational profiles The restoration and rehabilitation of the architectural heritage

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Occupational profiles
The restoration and rehabilitation of the architectural heritage

J.L. Paulet
in collaboration with the CCCA, Paris

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Foreword by CEDEFOP

Occupational profiles in the fields of rehabilitation and the conservation of historic buildings are hard to define since they involve qualifications grafted onto the conventional building sector trades[1]. These supplementary qualifications call for an extensive knowledge of the history of architecture and of advanced technologies in addition to those in use in former times. These attributes are rare on the European labour market, a fact which is revealed, unfortunately, when old buildings are restored without sufficient account being taken of the original plans, materials and processes.

On the basis of the five national reports, the present summary report recapitulates in tabular form all the common elements of occupational profiles linking skills with the demands of the activities in question. In our view, these tables could be used as guidelines by all present and future Member States of the Community wishing to implement national initial and continuing training measures. The saying that the whole is greater than the sum of its parts seems to be confirmed in this connection.

We hope that the tables presented here will constitute a contribution to cooperation and exchanges between national vocational training systems and that the related occupational profiles will be accorded the consideration they merit in all countries.

The individual national reports from Belgium, France, Germany, Italy and the United Kingdom have already been published in English, French and the language of origin. This summary report will appear in five languages (English, French, German, Italian and Spanish) to ensure the widest possible dissemination among decision-makers and those responsible for training in Europe.

E. Retuerto de la Torre
Deputy Director

G. Chomé
Project Director

1) On this subject, see the CEDEFOP publication. Comparability of Vocational Training Qualifications in the Construction Sector, Official Journal of the EEC, no C 292 of 20. 11. 1989.

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Preface

The CCCA-BTP[2] is a building industry trade body concerned for more than forty years with training and entry to the labour market for young people in the building and public works sector in France.

Following the Second World War, the economic situation, the existence of trade bodies and workers' organisations and the urgent need to rebuild in countries ravaged by war combined to lead to the adoption of education and training systems strongly influenced by national cultural factors.

In some countries, in-firm training took precedence over classroom training; in others, training was centred mainly on new building, while in yet others preference was given to the maintenance, repair and restoration of existing buildings.

On the technical side, it should also be noted that building works undertaken in the fifties and sixties were based on construction methods identical - or at least very similar - to those in use at the beginning of the century.

Traditional materials would be used, for example:

- stone, brick or concrete block materials, rendered or otherwise;
- structural elements and fittings in wood or steel;
- sanitary and heating installations using lead, copper, steel or caste iron piping;
- finishing materials applied to rendered surfaces, etc.

The demand for better thermal and acoustic insulation and better security did not really arise until the 1970s, prompted by the availability of multipurpose composite materials.

All this brought about a radical change in the nature of training for the building trades, which until then had derived from deeply-rooted traditions in which the industries in the various countries differed mainly as regards the materials used and the tools, which had been progressively adapted to suit those materials. Substantial differences in these respects existed from one country to another.

The CCCA-BTP therefore focussed on training young people in the new techniques, the use of new materials, tools and equipment, and the new industrialized construction methods (e.g. the use of prefabricated elements and new formwork techniques in reinforced concrete construction, and also the principles of thermal and acoustic insulation, which now involve a number of different trades) .

At the same time, however, the CCCA was concerned in preservation of traditional skills necessary for the maintenance, repair, restoration and rehabilitation of old buildings.

It should be recalled that maintenance, repair and restoration work accounts for over half of all activity in the building sector in France.

In consequence, at the beginning of the 1980s the CCCA called for the creation of a supplementary training course to lead to advanced vocational qualifications in the field of the restoration of historic buildings.

In concert with the Ministry of Education and after consultation with the CCCA's European counterparts through the REFORME network[3], a national diploma attesting to advanced qualifications in this specific field was established.

* * * * *

In 1990, when CEDEFOP presented its project aimed at better defining occupational profiles in the fields of restoration and rehabilitation, the CCCA thought this idea especially opportune and pertinent.

However, since we did not possess the resources necessary to carry out this study ourselves, we called on Jean-Louis Paulet, one of our associates whose various qualifications made him especially suitable for carrying out this work in concert with the CCCAs. Architect, builder and teacher, his activities have been concentrated for many years on the restoration of old buildings.

He also pioneered training methods involving the use of training sites, adding a new dimension to the training/work-experience systems strongly advocated by the CCCA.

For my part, I have followed the preparation of this summary report with considerable interest.

Meetings with our European counterparts and visits to a number of restoration sites enabled us to better understand the princi-

ples and practice of restoration and rehabilitation in the various countries represented.

We were also prompted to rethink our approach and review our practices and organizations to enable us to respond more effectively to the requirements of this steadily growing market which is, in addition, potentially an attractive sector for many young Europeans.

I should like to express my thanks to CEDEFOP for the progress it has helped us to achieve in this area .

Jacques Lorthioir
Director of Training

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2)REFORME (REstauration,FORMation,Europe) Network for exchanges between building industry personnel and bodies responsible for the the promotion of training. FORMEDIL (Italy) holds the presidency at the present time.

Foreword

This report represents the second stage of the "occupational profiles" programme applied to the field of the restoration and rehabilitation of the architectural heritage. It is based on reports prepared in 1991 in five Community countries - Belgium, France, Germany, Italy and the United Kingdom - and already published by CEDEFOP.

The aim of this report is to identify, in the respective national situations, common elements, common characteristics or elements specific to one country which could be promoted at European level; identify the principal elements in the content of the various qualifications in this sector; and formulate a number of proposals regarding the related occupational profiles.

The reader is referred to the national reports already published for details of the situations in the respective countries.

Chapter 1 - The situation

While the situation in the sector concerned varies in many ways from one country to another, a comparison of the national reports at once highlights an important factor: the definition of the architectural heritage.

Almost everywhere, this definition - which has gradually been broadened - is based on an earlier conception limited to buildings of historical or cultural interest which it was desired to preserve and restore.

The ICOMOS Charter distinguishes between the conservation of ancient buildings, which implies ongoing maintenance, respect for their characteristics and the preservation of their environment, and restoration, entailing a radical operation designed to ensure the preservation of a building carried out on an exceptional basis.

This definition was subsequently extended to cover the surroundings of the buildings in question, giving rise to the concept of historic centre or site, while today other buildings in the vicinity besides those of more recent construction are also included. In the latter case, the concept of rehabilitation applies.

Despite the deeply rooted cultural differences between European countries, certain common elements can be discerned, making it possible to sketch the outlines for a concept of the architectural heritage and the operations required for its preservation, whether restoration or rehabilitation.

The significance of these two terms, however, is not strictly identical from one country to another. While the term „restoration" is generally used solely in connection with historic buildings, „rehabilitation" has a more variable meaning; in some countries it is synonymous with restoration, while in others it refers to renovation work carried out on recent buildings in a poor state of repair.

In the countries studied, therefore, different levels of intervention are specified in respect of the architectural heritage (see, in particular, the UK report by David Matthews) in accordance with the state of preservation, historical or cultural significance and intended use following restoration of the buildings in question.

In this study the following general definitions will be used:

- the aim of restoration is to preserve the character and significance of a building, restoring its original appearance;
- the aim of rehabilitation is to return a building to a state in which it fulfils its intended function. When it also concerns the building's appearance, it is partly synonymous with restoration.

1.1 Legislation and regulation

Given this evolution in the significance of the terms used, it would be logical to expect a parallel development in the related legislation in the countries under study.

In every country the first measures in this area were adopted some time ago, often dating back to the end of the 19th or beginning of the 20th century. They were invariably aimed at the preservation and restoration of historic buildings. Many countries subsequently established lists of buildings protected under these measures (e.g. France, Italy, and the United Kingdom).

In certain cases the legislation was developed no further. In most countries, however, the provisions in this area were gradually extended in line with the broadening of the field covered.

In this way new provisions were introduced governing historic sites or centres (Italy), establishing conservation areas (United Kingdom), or combining several of these ideas (France).

The State intervenes at levels which vary from one country to another: in France, this area is mainly the responsibility of the central government, though often acting through its decentralized services, while in the United Kingdom public authorities at various levels are involved; in Italy the central, regional and local authorities all have an important part to play.

In addition to protecting historic buildings, in some cases the legislation also covers firms carrying out restoration work. In Italy, a series of „restoration charters" issued over the past sixty years embody recommendations regarding the principles to be followed by firms working on buildings subject to State protection. The quest for

specialized firms and the criteria with which to evaluate their capacities are matters of concern in all the countries studied. In France, Authorisation 15 (specialization in historic buildings) is accorded to firms by a committee comprising government and building trade representatives. In Italy, the regional authorities select firms with experience in the field of restoration from an unofficial list. Both these cases solely concern firms selected to carry out work on historic buildings.

A third aspect of intervention by the public authorities is financial aid to private individuals or bodies for restoration or rehabilitation work. This may take two forms, as follows:

- aid for the restoration of buildings of historic interest (which does not necessarily mean that they must be very old), involving subsidies (e.g. France and Belgium), tax concessions (Italy, in some cases), or both (United Kingdom);
- aid for rehabilitation of districts in disrepair and disadvantaged populations. Programmes of this kind are aimed at a social objective as well as the renovation of urban zones (France, Belgium and Germany).

However, in general legislative provisions have had little direct influence on systems of training and qualifications. Even where governments demand that firms working on historic buildings should possess specific competencies, they confine themselves to seeking firms with experience of this type of operation, without stipulating that the workers involved must hold particular qualifications.

Since 1975, the European architectural heritage year, the (Community has gradually been introducing legislation at European level to replace these measures.

1.2 The scale of the market

The vigorous development of regulatory activity in this field paralleled the growing concern on the part of the public authorities, intermediate structures (e.g. in the United Kingdom) and individuals, making it necessary to provide a legal framework for restoration and rehabilitation to ensure that quality standards were maintained. David Matthews, in particular, cites the ups and downs suffered by the British architectural heritage over long periods.

The market share of restoration and rehabilitation - including maintenance work - is growing in all countries, and ranges from 30-50% in Belgium to 50% of the overall market in Italy and France. Everywhere a strong trend can be seen towards preserving and using historic buildings, situating current activities in a historic context and finding means to reconcile contemporary life with the cultural and architectural heritage - and its long development - that these buildings represent.

New functions are being found for increasing numbers of old buildings, while the renovation and rehabilitation of historic cities and centres is gathering pace.

However, neither public nor private promoters are necessarily aware of the particular problems arising in connection with work on existing buildings, which are sometimes inhabited during the operation. Regulation is not always sufficient to ensure the quality of the result, which largely depends on the firms involved.

1.3 Firms and their workers

There are few specialist firms in this field, most working on both new construction and existing buildings. This is true in all the countries studied, resulting in numerous deficiencies in the quality of restoration and rehabilitation work. Everywhere, stress was laid on the damage caused by the application of inadequately mastered modern technologies to older buildings. In every country the need for higher levels of competence and better quality work on the part of the firms was repeatedly asserted; however, firms fear that if they provide training, the personnel in question will subsequently leave to set up on their own account.

While high-grade restoration work on buildings of historic interest is carried out by highly qualified personnel, the quality of work carried out on buildings of lesser importance is much more variable. In such cases firms try to operate simply by adapting standard methods to particular technical requirements, since many new construction practices can still be employed. In certain countries (e.g. the United Kingdom and Italy), firms obtaining contracts for work in this field will sometimes subcontract operations for which they do not possess the necessary skills.

The extent of the problem can be seen at once from the fact that many countries complain of the deskilling of building industry workers. Of the five countries studied, three stress this point specifically

(Belgium, France and Italy). The loss of know-how, the decline of the traditional trades, the lack of adequate diagnostic skills, and the frequent use of techniques incompatible with the nature of the buildings worked on are some of the most frequently cited problems.

The problem is worsened by the fact that these trades are unattractive to young people, with the result that know-how is not passed on and there are insufficient numbers of young technicians and supervisory staff in the industry to ensure the maintenance of high skill levels.

All five countries expressed a need for skilled manpower, with some (e.g. Germany) pointing to a demand for certain particular trades.

In most countries, however, collective agreements generally make no provision in their classifications for specialized qualifications relating to rehabilitation and restoration.

In most cases tasks relating to restoration or rehabilitation are specified only at high qualification levels - though with no specific denomination. In the labour market, distinctions are sometimes made between new-building workers and rehabilitation and restoration specialists - especially as regards pay levels. In France, however, a given specialization does not always give rise to the same benefits, since firms accorded Authorization 15 are generally SMEs and salary levels are sometimes low; other specialist workers, on the other hand, obtain good pay levels.

1.4 Training and qualifications

No system of qualifications specific to restoration and rehabilitation exists in any of the countries represented. In every case basic qualifications relate to new construction, to the extent that the share of traditional technologies in the related training is being steadily reduced.

Restoration and rehabilitation skills are therefore acquired essentially through on-the-job training or continuing training courses. Certificates or other formal attestations to the skills acquired in this way are rarely accorded. In addition, the situation appears to differ sharply from one country to another.

In the United Kingdom, skill shortages are acute; firms apparently make little effort to train their workers for fear that they will subsequently be tempted away by one of their competitors.

Even in Germany, where continuing training for these trades is considered to be well developed, specific qualifications in conservation/restoration/maintenance relate only to high levels of specialized technical training such as that provided by the technical universities.

In France, the first specific endorsement (European Level III) to initiate continuing training qualifications was introduced by the Ministry of Education on the CCCA's initiative. It is rarely accorded, however, and here too there is a crying need to do more.

This example is somewhat similar to the situation in Belgium, where training is essentially given in the school system; however, in some cases students have the option at age of 16 or 18 of following a one-year specialization course which includes supplementary training in rehabilitation and restoration. This course is available only to a limited number of students; however, training activities are also organized by firms.

It is true that the importance of skills specific to rehabilitation and restoration and supplementary to the basic skills of the trade varies significantly from one trade to another. While a knowledge of older techniques is indispensable, it is far from being the only specific capacity required to become a fully trained specialist in the rehabilitation and restoration of historic buildings. An aptitude for diagnosis is also needed, to a degree varying with the worker's level of responsibility on the site.

A capacity to choose the appropriate form of intervention - including the use of innovative technologies - is one of the foremost requirements for work on existing buildings.

Public concern about old buildings combined with the inability of the industry and training bodies to provide an adequate response to this concern have, however, brought about certain new developments during the past few years.

In Italy the Collective Agreement (Article 88) now provides for the possibility of setting up „training firms" to train future building industry personnel, in which older techniques are being gradually redeveloped under the aegis of FORMEDIL, the coordinating body. In the United Kingdom measures were adopted in 1986 to establish a framework of National Vocational Qualifica-

tions; in the field of conservation, this work was entrusted to COSQUEC. In France, a qualification in the form of an endorsement „Restoration of the architectural heritage (carcass work)", prepared under the aegis of the CCCA, has been introduced and is now recognised by the Ministry of Education as a Level III (European) diploma. The French report also describes the first training course for rehabilitation engineers, launched by the Limousine Regional Training Association (AREF-BTP) in conjunction with the CNAM. In Belgium, the principal new development is the Saint Hubert training site, while in Germany, the Chambers of Crafts have developed training courses in rehabilitation with a duration of up to 13 months for foremen, site supervisors and technicians, leading to a qualification in rehabilitation work.

Citing only the most striking examples (by no means an exhaustive list) from the countries studied demonstrates the recent proliferation of initiatives launched in response to growing needs and an expanding market. However, there remains a considerable gap in both quantitative and qualitative terms between these beginnings and actual and potential needs.

Since the qualifications in this sector have only very recently been established, they have not yet been fully shaped by the influence of local cultural factors and traditions. Occupational profiles can therefore be developed which take account of traditions specific to the country in question, while being consonant with broadly comparable profiles at European level.

This illustrates the objective of the „occupational profiles" programme, here applied to the restoration and rehabilitation trades.

The aim of the next chapter is to define, in relation to each of the component parts of a building, the basic skills required - in whichever country they are exercised. This does not obviate the need for adaptation or differing emphasis to correspond to the particular features of the respective trades in each country.

Chapter 2 - Principal characteristics of the occupational profiles

The tables which follow set out the skills required in connection with each constitutent part of a building. In the various countries of the Community a given task is not necessarily performed by a member of the same trade. The problem, then, is to situate certain skills listed as relating to this or that trade within their national contexts, taking account of the fact that groups of skills are combined in different ways in the various countries to constitute trades, as is clearly shown in the respective national reports. Similarly, the tasks listed do not always fall within the same functions.

Consequently, in the respective countries different skill levels are required to fulfill the various functions, in accordance with the level of responsability involved.

For the occupational profiles we are concerned with, a basic knowledge of the trades provides the foundation to which the specialized skills are added.

The tables are concerned with skills specific to restoration and rehabilitation:

- the aim of restoration is to conserve and enhance the aesthetic and historic value of a building, on the basis of a respect for its original fabric and a study of authentic documents (Venice Charter);
- rehabilitation concerns the renovation of a building using contemporary materials, possibly with the addition of new structures required in some cases to improve comfort and safety.

The table headings

1. Parts of buildings

This concerns parts of existing buildings subject to defects. Given the multiplicity of cases, general denominations are used to cover a variety of situations calling for similar treatment.

For example, „projection or overhang" covers cornices or balconies in stone or concrete.

2 . Defects

This refers to observable defects, though without identifying their causes, which concern contingency management.

For example, surface fissures may arise from poor construction, but also from shifting masonry or fractures caused by frost.

3. Contingencies

This column lists the situations regularly encountered on restoration and rehabilitation sites (those which normally concern particular trades are described in the provisions relating to the comparability of qualifications).

They relate directly to the specific skills required to deal with them.

4. Treatment

This column lists the tasks to be performed. In certain cases, new-build techniques may be sufficient, when backed up by specialized knowledge. The treatment selected depends on the results of the diagnosis.

5. Techniques

This column, together with column 6 ("Knowledge"), describes the range of skills and competencies required. The techniques applied vary according to the treatment selected, which depends on the results of the diagnosis.

6. Knowledge

This column summarizes the knowledge required for the different types of work. However, the level required may be assessed in terms of levels of training or specialization.

The minimum knowledge required for each operation carried out on existing buildings is listed. However, in addition there are two fundamental requirements:

- knowledge and skills must be oriented towards the specific purposes of rehabilitation or restoration, to enable the quality of work carried out to be assessed;

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a marked aptitude for diagnosis is also essential.

It should be noted that certain operations (tasks) are regularly required in restoration and rehabilitation work: these include shoring, sheeting, measurement, diagnosis, dismantling and reassembly .

FOUNDATIONS

Parts of buildings	D e f e c t s	Contingencies	T r e a t m e n t .	T e c h n i q u e s	K n o w l e d g e
Foundations in mass concrete strip footing, boreholes or piles	Subsidence & destruction of building	Collapse of structure Landslip Discovery of elements requiring protection	Underpinning Shoring & sheeting Casing & sealing in various materials Drilling &/or injection	Operation of machinery & equipment Injection Drilling	Soil mechanics Statics & strength of materials
Foundations in damp soil	Inflorescence, humidity, destruction of materials	Destruction of supported structures	Injection Sawing Drilling	Operation of machinery Drilling &/or injection	Hydrologic cycles in masonry Mutual compatibility of materials

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WALLS

Parts of buildings	Defects	Contingencies	Treatment	Techniques	Knowledge
Defective materials	Fissures Cracks	Collapse Deterioration of framework	Shoring Cutting & fitting of elements Hollowing out Repointing	Cutting of materials Operation of hand tools or electric tools	Composition of materials & their mutual compatibility
Stonework	Disintegration		Shoring	Injection	Composition of old types of binders & mortars
Projection or overhang	Destruction of materials	Disintegration of framework	Shoring Cleaning	Measurement of elements, drawing, moulding Use of substitute products Fixing systems	Technology of old materials & their employment Environmental effects on buildings Compatibility of old & new materials Types of decoration & styles
Interface between new & old elements	Disintegration	Collapse Dislodgement of masonry Fracturing of framework Fissures Cracks	Shoring Casing Injection	Operation of injection &/or drilling machinery or equipment	Knowledge of statics & strength of materials, applied to compression, tension, or bending stresses in simple structures

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PARTITION WALLS

Parts of buildings	Defects	Contingencies	Treatment	Techniques	Knowledge
Mortars & rendering of various types	Detachment Peeling Fissures	Dislodgement of masonry Discovery of elements of value Preparatory work for treatment of surfaces Other	Complete disassembly Dismantling & partial strengthening Injection Substitution of materials Cleaning of stonework using technologies appropriate for the materials & products used	Dressing Washing Refixing without damage to surface	Technology of old materials & building methods Environmental effects on buildings Compatibility of old & new materials Types of decoration & styles
Projections, cornices, etc.	Detachment Disintegration Destruction Disappearance	Repair of supporting structure	Shoring Dismantling & reassembly Fabrication of identical elements, of similar composition or otherwise Injection	Operation of injection &/or drilling machinery or equipment	
Cement rendering	Edge cracking Corrosion of reinforcing elements	Fracturing of reinforcing elements Detachment of elements	Renovation of elements by cleaning & injection	Injection Making good on top of reinforcing elements	Technology of products for making good

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FLOORS

Parts of buildings	Defects	Contingencies	Treatment	Techniques	Knowledge
Binders, common joists & trimmer joists . Framework of various types	Corrosion & various types of decay Flexion	Effects on partition walls Destruction of rendering & plastering Disintegration of structure	Shoring Strengthening Substitution	Bracing Injection Gluing	Technology of old materials and methods Environmental effects on buildings Compatibility of old & new materials Types of decoration & styles
Hollow flooring blocks	Animal or fungal infestation	Destruction of materials Noise		Injection	Compatibility between substitute materials & those originally used

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WOODWORK

Parts of buildings	D e f e c t s	Contingencies	T r e a t m e n t	T e c h n i q u e s	K n o w l e d g e
Roof trusses & rafters	Decay due to: - insect infestation; - fungi; - humidity	Disintegration Effect on supporting masonry	Shoring Cleaning Bracing Substitution Impregnation	Use of synthetic products	Technology of products used for treatment
Structures carrying decoration				Work by hand Fabrication of tools	Types of decoration & styles

ROOF COVERINGS

Parts of buildings	Defects	Contingencies	Treatment	Techniques	Knowledge
Covering in natural materials	Wear & tear Deterioration	Deterioration of supporting structure Dangerous access .	Substitution adapted to fit structure	Working of materials by hand	Knowledge of old techniques & methods Environmental effects on materials
Covering in prefabricated materials or sheet metal			Replacement with identical materials	Refitting following lines of existing structure	
Lightning conductor	Absence or destruction		Maintenance or fitting of new equipment	Use of hand tools	Electricity

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WATERPROOFING & DRAINAGE

Parts of buildings	D e f e c t s	Contingencies	T r e a t m e n t	T e c h n i q u e s	K n o w l e d g e
Guttering & flashings	Corrosion Destruction	Effects on supporting structure	Fabrication and fitting of rust-proofed elements	Measuring of elements Impregnation techniques	Types of architectural decoration
Decorative elements, hip tiles & cornices		Disintegration			Environmental effects on materials
					Electrolytic phenomena

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PLASTERWORK

Parts of buildings	Defects	Contingencies	Treatment	Techniques	Knowledge
Stucco, fibrous plaster & plaster elements on plane surfaces	Scaling Peeling Fissures	Dislodgement of masonry Discovery of elements of value Preparatory work for treatment of surfaces Other	Complete disassembly Partial strengthening Injection Repair using materials identical to original	Cleaning using techniques appropriate to materials & products	Technology of old materials & methods Climatic effects Compatibility of old and new materials Types of architectural decoration Technology of adhesives & finishing products
Interior projections, cornices, etc.	Destruction of materials Dislodgement Disintegration Destruction Disappearance	Disintegration of framework As above	Fixing of prefabricated elements in materials identical in form & composition, or fitting of elements in substitute materials	Measuring of elements, drawing, moulding Application of substitute products Fixing systems	

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JOINERY

Parts of buildings	Defects	Contingencies	Treatment	Techniques	Knowledge
Doors, windows & shutters	Deformation Deterioration resulting from various decay	Infiltration Wear & tear	Substitution of elements	Measurement Fabrication of tools Treatment of woodwork	Inspection & assessment of condition of building History of architecture & decoration (especially furnishings & decorative elements) Knowledge of materials & restoration techniques Ply & inlaying techniques Surface treatment of wood without damage to material Wood carving & inlaying Methods of cleaning, protection & reinforcement Polishing & gilding techniques Ornamentation & calligraphy Thorough knowledge of & capacity for free drawing, construction drawing, perspective drawing & diagram drawing
Pannelling & parquet		Virtual destruction of elements	Strengthening	Measurement Moulding Repair of support structure Injection Treatment by application of various noninjurious products	

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GLAZING

Parts of buildings	D e f e c t s	Contingencies	T r e a t m e n t	T e c h n i q u e s	K n o w l e d g e
Leaded glass	Breakage or deterioration of glass Corrosion of lead cames	Effects on supporting structure	Cleaning of glass Releading & puttying of glass	Glazier's skills	Technology of glazing Composition of old glass Heat-related calculations Technology of old materials Environmental effects on materials Production of coloured glass surfaces, glass inserts & the use of paints on glass Restoration of windows of historic interest: glass signs & letters, glass mosaics Other glazing work using lead, brass, etc. These supplementary qualifications solely concern special skills relating to artworks & their restoration. They do not involve specialization in architectural restoration
Double glazing or secondary glazing	Wear & tear	Deteriorated or fragile supports	Strengthening of supports		

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TILING & PAVING

Parts of buildings	Defects	Contingencies	Treatment	Techniques	Knowledge
Tiling	Deterioration of surfaces	Fragile or damaged supporting structures	Disassembly Application of appropriate products	Use of finishing products Cementing	Technology of old materials Types of flooring decoration
Mosaics	Destruction of setting Disappearance of elements		Repair of settings or supports Reconstitution of design with identical material	Moulding Cementing Treatment by application of suitable products	As above Cutting techniques
Granolithic	Destruction of parts of elements		Reconstitution of products with appropriate materials	Analysis of composition	Granolithic technology
Paving	Disappearance of elements Unevenness		Removal & refitting Substitution of identical materials	Paving techniques	Solidity of ground or supports according to use

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PAINTING

Parts of buildings	Defects	Contingencies	Treatment	Techniques	Knowledge
Mural painting	Detachment Loss of binder Stains Irregular discolouration	Defective support surfaces	Refixing	Micro-injection	Technology of old paintings History of the techniques of painting
Fresco painting	Detachment	Defective supports	Removal, Repair of support surfaces Refixing	Use of adhesives	Fresco painting techniques Lime plaster technology
	Irregular discolouration	Unsuitable earlier work	Removal or application of pigments of the same composition		Age of fresco paintings
Painting on wood	Detachment Loss of binder Stains Irregular discolouration	Defective supports	Restoration of colours	Antique finishing Treatment by application of suitable products	Age of mural paintings
Wall coverings of various types	Irregular discolouration		Refixing	Use of adhesives Treatment by application of suitable products	Technology of old wall coverings & methods of fixing
Gilding	Detachment				Technology of materials

In the case of certain paintings or other works of interest or importance, specialists should be called in. In the absence of a supervisor, the worker concerned should be able to evaluate the limits of his capacity to intervene on the basis of the skills he possesses and assess the importance of the work in question

METALWORK

Parts of buildings	Defects	Contingencies	Treatment	Techniques	Knowledge
Railings & balconies	Rust	Loosening of elements Deterioration of support structure	Cleaning Shoring Renovation of elements	Measurement of elements Application of cleaning products Welding	Types of wrought or cast iron decoration Technology of metalwork
Metal tying	Fracture Rust	Disintegration of support structure	Shoring Drilling	Operation of equipment	Statics Strength of materials Knowledge of old materials & technologies

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In this field, where as a result of standardization modern installations are mandatory, particular attention must be paid to the condition of supporting structures prior to any intervention.

SANITARY INSTALLATIONS, HEATING & ELECTRICITY

Parts of buildings	Defects	Contingencies	Treatment	Techniques	Knowledge
Renovation of existing installations	Wear & tear Functional unsuitability	Deterioration of support structures	Replacement of elements	New construction techniques	Rehabilitation work and advice to the inhabitants of buildings undergoing rehabilitation require the following knowledge and capacities: - an acute sense of detail, besides the patience & determination needed to locate old piping or wiring & distribution mechanisms; - an ability to use modern equipment without harming the fabric of the building, for example the use of diamond drills for the renovation of masonry or stone work. For this entire area, multi-skill qualifications such as plumber & installer of gas & electrical appliances & equipment are desirable.

Chapter 3 - Conclusions

The consensus view appears to be that occupational profiles in the restoration and rehabilitations sector require a complete mastery of the basic skills appropriate to each trade, plus specific supplementary skills to ensure that personnel are fully competent to carry out work on existing buildings: this report will propose that training should be organized along these lines.

Restoration and rehabilitation work, therefore, call for supplementary skills in relation to each of the building components referred to in this study; however, they may be exercised differently in accordance with decisions made regarding the treatment of buildings in question.

Consequently, it is important that qualified personnel should clearly understand the objectives of restoration and rehabilitation, which are determined by three basic aspects:

(1) the condition of the building;
(2) its construction date;
(3) the importance attached to its conservation.

It may be noted that these aspects are interconnected; they also determine the corresponding training needs.

3.1 Constituting a pool of skilled workers in the restoration and rehabilitation trades

3.1.1 Training needs

The requirements of the new building sector have gradually resulted in the removal from training programmes of everything relating to older materials. As an example, for some time the technical rules for the use of materials failed to include air-hardening lime, the use of which has become rare in modern buildings; however, it has recently been reinstated.

The results of this trend are:

- deskilling;
- a lack of knowledge of the composition of products and their real performance;
- the substitution of superficial, cosmetic practices for the use of techniques based on skills.

Further, substitute materials comprising synthetic resins or thermoplastics, of high performance when applied to suitable materials or supports, can be detrimental to the fabric of old buildings.

Here again, stress must be laid on the need for knowledge of the physical and chemical characteristics of the materials through rigorous training in this area backed up by independent research laboratories.

It is therefore a matter of urgency that training relating to old buildings should once more be included in initial training courses in the building sector since qualifications similar to the endorsement (Mention complementaire) referred to earlier - even though they represent an advance in the attempt to meet the need for qualified personnel - imply that serious shortcomings exist in the knowledge and skills acquired through a basic training which relates exclusively to new-build.

At first, however, apart from the skills and knowledge discussed under 3.1.2 below, stress could be laid on the following aspects:

- old techniques, their performance and limitations;
- old materials, their composition, durability and mutual compatibility;
- diagnostic methodology, which is at the heart of the entire range of skills in this field.

3.1.2 Knowledge and skills

In addition to the specific techniques listed in the tables, there exist groups of skills fundamental to restoration and rehabilitation work which constitute an essential common core in the training of all personnel assigned to work on old buildings.

Old building methods

The building methods employed in the past were established on the basis of several interdependent criteria:

(a) durability;
(b) the materials used;
(c) the technologies employed.

These criteria vary in line with the degree of sophistication and durabilily of the buildings in question. Another aspect is the development of new techniques and materials and

changes in living standards and lifestyles, which directly affect the soundness of buildings and the use to which they are assigned

The application of modern construction principles, established on the basis of contemporary criteria, introduces ideas totally at variance with the principles applied originally. For example, timber-framed buildings with wattle and daub filling are considered to lack solidity, by constrast with stone structures: clearly, intervention would call for different methods in each case.

In former times the presence of a degree of humidity and a lack of draught exclusion were tolerated, which would be unacceptable today: excluding humidity from a building inadequately waterproofed calls for specialized treatment. Any operation to convert an old building for use as a modern dwelling entails consequences as regards conservation. Finally, while new construction proceeds from the bottom up - i.e., foundations, masonry, and then roofing - restoration and rehabilitation work proceeds from the top downwards: first roofing, to exclude water, then walls and/or foundations to ensure stability, site organization and planning being adapted accordingly.

Knowledge required for diagnosis

A knowledge of traditional materials and their use throughout history, and old technologies and their development in relation to the evolution of society are needed to assess the methods used in a particular case in relation to a range of skills often linked to the quality of the structure.

In some cases simple structures show evidence of the builder's incompetence, or on the other hand his ingenuity in overcoming the inadequacy of the means at his disposal. These aspects, which bear witness to the history of the trades in question, are of value to contemporary specialists in their work of diagnosis.

Typology of buildings

The form and function (or functions) of a building and the chronology - in so far as it can be determined - of the maintenance operations carried out make it possible to situate it within its era of construction. This information is of value for diagnosis and especially in determining the choice of conservation techniques to be employed.

Changes in structures and materials over time and environmental effects

The maintenance work carried out on a building and the conditions in which it exists are factors determining its present state. A knowledge of the ageing of materials and their resistance to the deleterious effects of humidity, airborne agents and infestation also contributes to the work of diagnosis.

Knowledge required to determine the appropriate treatment

In addition to a knowledge of the old techniques referred to above, a knowledge of statics is required to assess the stability of the buildings concerned.

In many cases the building's stability will have been affected by changes to its environment or in the materials of which it is composed. This process should be controlled rather than arrested, since the introduction of rigid elements in a shifting structure can introduce serious problems.

The composition and performance over time of contemporary materials must be known, but their look must also be taken into account. Today's synthetic materials offer a satisfactory appearance, but their characteristics (e.g. flexibility, rigidity or inflammability) make them unsuitable for certain applications. The problem is to reconcile these aspects and assess the need for the use of these materials in a variety of situations.

Finally, adding new materials and structures to an old supporting structure implies a need to master interface problems; the performance of both old and new elements must be fully understood to assess compatibility.

Technical know-how

The renovation of parts of buildings frequently involves the use of injection, bracing or dowelling techniques - except where a complete new element is to be substituted. However, the techniques used should be adapted in accordance with the nature of the materials encountered in buildings differing in age and structural characteristics.

Skill levels therefore relate to the number of different situations encountered, in addition to a knowledge of the characteristics and performance of materials.

Finally, for certain operations, tools and equipment must be adapted to the situation, requiring a capacity to conceive and carry out the adaptations necessary. An ability to carry out a basic analysis of materials and support structures is also important, contributing to the work of diagnosis .

Additional skills and capacities

The skills and capacities described above can be extended to other levels, enabling personnel to expand their field of competence.

Example: environmental effects on materials and the performance of various old materials, or the phenomena of evaporation and condensation and their effects on products used to treat surfaces.

These additional skills imply a high degree of specialization in trades specific to old buildings, leading towards recognized qualifications in restoration.

3.2 Factors conducive to the constitution of occupational profiles

3.2.1 Exchanges and networks

One of the principal factors conducive to the constitution of occupational profiles is the development of exchanges between building industry personnel, whatever their particular field.

Both the work entrusted to CEDEFOP by the EC Commission and the Expert Group set up by the Council of Europe seem to promote the development of productive contacts since in both cases their work results in recommendations and proposals which tend to further this activity.

Some exchanges already take place in frontier areas - especially along the Franco-German border - between building firms and chambers of trades. Bilateral programmes have been established by Germany and Italy, for example, and Germany and France (the Fulda Centre and the Avignon School both offer a three-week specialized training course).

The PETRA programme also contributes to these activities through exchanges between young apprentices by studying techniques used in other countries, sometimes including techniques in use in former times.

At the same time, networks such as the REFORME Network, organized on the initiative of the CCCA, facilitate contacts between restoration and rehabilitation specialists and personnel concerned with training for the related trades. REFORME promotes exchanges, transfers of knowledge and know-how and the constitution of a body of specialists at international level. The following countries participate through the agency of their joint vocational training structures: Belgium, France, Italy, the Netherlands and Spain. The growing number of these initiatives and their support by the public authorities will constitute an important positive factor in the development of occupational profiles at European level. The FORCE and EUROFORM programmes should prove to be particularly well adapted, within the existing spectrum of Community measures, for the development of programmes to promote the establishment of European occupational profiles.

3.2.2 Instructor training

Few projects have yet been launched in this field. Almost everywhere, instructor training is confined to new-build techniques, thus curbing the development of training in restoration or rehabilitation, whether in basic or specialized courses. The development of this training is essential for the constitution of suitable occupational profiles.

At present, teachers wishing to include rehabilitation and restoration in the content of training courses they are developing with their trainees can themselves only obtain training in the skills they wish to transmit through continuing training courses intended for all building sector personnel. Training in the essential skills can be obtained in centres such as Fulda in Germany, San Servelo in Italy, the Avignon School and from certain CAUEs (architectural, town planning and environmental advisory committees) in France.

In several countries, however, the link between schools and firms goes further, forming an integral part of the training process. The variety of forms taken by training/work experience programmes and apprenticeship schemes illustrates the possibilities for cooperation in this area. Rehabilitation and restoration are fields which call for continuing confrontation between real situations and the classroom study of skills and know-how. A comparison might be drawn with medical training, in which diagnosis can only be learnt by involvement with real cases.

This association between training bodies and firms favours the progress of trainees towards their goal of becoming qualified tradesmen. In this connection, the development of training sites is a significant innovation.

3.3.3 The official recognition of qualifications

The present absence of recognition of qualifications in the area we are concerned

with is a problem which must be overcome if the related occupational profiles are to be developed.

While validation procedures vary from country to country, being dependent in some cases on the public authorities and in others on firms or the two sides of industry, the recognition of the skills in question in the context of new occupational profiles combining the basic skills of the trade with specialized skills in restoration and rehabilitation is indispensable if a body of personnel qualified in the maintenance and conservation of the architectural heritage is to be established.

Further, at this stage in the building of Europe, recognition at European level - whether through equivalence, correspondence, mutual recognition or any other mechanism - would promote the establishment and development of the related occupational profiles.

Naturally, there is no question of seeking to impose a European mould in a field characterized by cultural factors specific to each country. However, common elements for European occupational profiles can be established while taking full account of individual cultural factors.

CEDEFOP - European Centre for the Development of Vocational Training

Occupational profiles
The restoration and rehabilitation of the architectural heritage

J.L. Paulet
in collaboration with CCCA, Paris

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As part of the project "**Directory of occupational profiles at Community level**" CEDEFOP carried out research in five countries on qualifications relating to the restoration and rehabilitation of the architectural heritage.

In this report the author has made a comparative analysis of the various subjects examined in the national reports:

- legislation and provisions relating to the restoration and rehabilitation of the architectural heritage,
- the systems of initial and continuing training,
- market trends and collective bargaining agreements.

A large part is devoted to a summary analysis of 14 component parts of buildings.

Summary tables for each of the component parts identify

- common occupational tasks,
- occupational activities and
- the knowledge and skills of the manpower in the five countries reviewed.

The synthesis report provides "Euro-profiles" containing common basic elements classified at national level and is enriched by the expertise of the Council of Europe, architectural heritage division and by the European Centre for training skilled workers in conservation of the architectural heritage, Venice.

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Summary report